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d'Orbigny referred to the triassic in Bolivia are by Brackebusch placed in the Wealden or Neocomian. In these Mesozoic strata occur many petroleum springs, and throughout Jujuy and Salta, in Bolivia, and probably below the diluvium of the Gran Chaco, the character of the formation is such that Brackebusch styles it the "petroliferous formation." A small basin near Jujuy has Post-tertiary strata, with beds of lignite and mastodon remains. Eruptive rocks occur in many localities, and gold ore is found in the beds of the streams which flow from the Sierra Cabalonga. ——Part I of the "Grand Atlas of the Second Geological Survey of Pennsylvania," with fifty sheets imperial folio, has been published at Harrisburg.——The two "Prix Vaillant" of the Academie des Sciences de Paris have been given, the first to M. Gustave Cotteau, for his researches among fossil echinoderms; the second to M. Emile Riviere for his work in prehistoric anthropology. M. Cotteau has published more than 1000 plates of echinoderms; and for thirty years has been known as a palæontologist. The results of the researches of M. Riviere have been published in a work entitled "L'antiquité de l'homme dans les Alpes Maritimes."——M. Dieulafait is now engaged in studying the deposits of iron, manganese and zinc which exist around the "Plateau central," in the Cevennes particularly. He arrives at the conclusion that these deposits are derived from the primordial rocks from which they were extracted by the action of sea water.——A. W. Waters has described more fossil cheilostomatous Polyzoa from South Australia. Of the 220 species now described in the series of papers, about half are still living. The species noticed in this paper are seventy-three in number. Attention was called to the fact that, though the shape and nature of the zoœcial avicularia are characters of the greatest value, yet their presence or absence cannot be made a specific distinction, as there are a large number of cases where specimens are found with none or only a few such avicularia, whereas on other specimens of the same species they may occur abundantly.

MINERALOGY AND PETROGRAPHY.[1]

PHYSICAL MINERALOGY.—*Cohesion.*—It has long been known that, aside from directions of minimum cohesion (true cleavage) in crystals there are certain planes in which a slipping of the molecules takes place with especial ease. These are called by the Germans "*Gleitflächen*," and to our knowledge of them a considerable series of papers by Mügge has largely contributed. This writer concludes that the "*Gleitflächen*" coincide with the cohesion maxima along which the molecules can be parted only with the greatest difficulty, while they may be made to slip or slide over each other as easily in this as in any other direction. The position of these planes was determined for gypsum, stibnite, bismuthinite, orpiment and cyanite,[1] and found to agree as regards their direction with what had earlier been observed in the case of mica, rocksalt, calcite and galena. Later, the application of Reusch's method of forming the so-called fracture figures ("*Schlagfiguren*") showed that the same was also true of erythrite, vivianite, hydrargillite, brucite, potassium ferrocyanide, uranium mica and even apophyllite and topaz. In the case of the two latter minerals, it was necessary to use a diamond-pointed instrument to make the impression.[2] Most interesting, however, are these "gleitflächen" in calcite, where they stand in the closest relation to the twinning planes. As "*structure planes*" Mügge designates all those along which slipping or a parting of the molecules can be readily effected. Of these in calcite R is the true cleavage plane ("Spaltungsfläche"); —½R the slipping plane ("Gleitfläche"), while parallel to ∞P2 and 0R parting readily takes place under pressure in the proper direction ("Reissflächen"). If an artificial sliding of a portion of a calcite rhombohedron into twinning position parallel to —½R be effected, the position of the R-faces remains unchanged; the —½R-faces, except the one in which the sliding took place, assume the position of ∞ P2 planes, while these in turn come to occupy the place of —½R. A 0R-face takes the position of —2R, parallel to which a parting has also been observed by Haidinger and Tschermak. Thus all the structure planes retain the same positions, although they exchange them among themselves. It is significant that all these planes, except ∞P2, which is a plane of symmetry, have been observed as twinning planes for calcite.[3] The great ease with which by slight pressure the molecules of calcite may be pushed into twinning position parallel —½R suggests a similar origin for the lamellar twinning of many silicates, especially as this is often observed to be most developed where the pressure has been greatest. Van Werveke has called attention to this in the case of feldspar and diallage;[4] Bauer, in the case of cyanite.[5] Analogous examples seem to be Malacolite and salite (‖ 0P), epidote and mica. [The present writer has recently observed that the apparently perfect cleavage of so much of the American sphene is conditioned by fine twinning lamellæ parallel to the face —4P (Dana), which appear to belong to this same category, and may possibly have been produced by pressure. Hornblende rarely exhibits the same structure parallel to 0P.][6] Mügge also describes twinning lamellæ in imbedded masses and crystals of hematite and corundum. They lie parallel to the face R, which plays here the same *rôle* as "Gleitungsfläche" as —½R does in calcite. A similar structure is frequent in the Graves Mt. rutile parallel ∞P.[1] In these cases also, as with the silicates, the nature of the material prevented the artificial production of the lamellæ. In some minerals where no alteration of molecular arrangement could be brought about by pressure, this result was accomplished by heat. By a sufficient increase of temperature twinning lamellæ were seen to be developed in anhydrite,[2] cryolite[3] and leadhillite,[4] while thenardite was rendered optically uniaxial,[5] as Mallard had showed was the case with the corresponding potassium salt. (For the very interesting results of a similar nature obtained by Förstner on the feldspars of Pantellaria, see below.) W. Klein[6] contributes an interesting paper on the influence of heat on the optical properties of crystals, especially when this is applied unevenly to different portions of the section. Negative, uniaxial minerals, like apatite and calcite, show an opening of the interference figure into two hyperbolas, the line joining them being perpendicular to the direction in which the heat is applied. For positive crystals the same is observed, except that this direction is parallel to the line joining the hyperbolas. Biaxial crystals also exhibit similar phenomena, so that uneven heating may be regarded as a test of the character of double refraction similar to the use of the quarter undulation mica plate. The mineral, *heulandite*, is also made the subject of an extended investigation, the results of which cannot be here given. The *beaumontite* from Baltimore, commonly regarded as a variety of heulandite, shows such an entirely different optical behavior that the writer is inclined to agree with Rose in regarding it as a separate species.

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[1] Edited by Dr. GEO. H. WILLIAMS, of the Johns Hopkins University, Baltimore, Md.

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[1] Neues Jahrbuch für Min., etc., 1883, II, p. 13.

[2] Ib., 1884, I, p. 50.

[3] Neues Jahrbuch für Min., etc., 1883, I, p. 32.

[4] Ib., 1883, II, p. 97.

[5] Zeitschrift der deutschen geol. Gesell., 1878, XXX, p. 320.

[6] Amer. Jour. of Science, June, 1885.

J. Beckenkamp[7] describes a new and delicate apparatus for the measurement of the constants of elasticity in crystals. The results of numerous determinations are given whereby the conclusion is reached that the elasticity, like all the other physical properties of crystals, is in exact accord with the geometrical properties. The elasticity of alum was found to be less than that of any other known substance, which accounts for its anomalous double refraction, inasmuch as very slight pressure can produce a molecular disturbance. The elasticity of any crystal was found steadily to decrease with repeated compression.

R. Brauns[8] considers that the much discussed optical anomalies of regular crystals are in many cases due to chemical impurity, especially the crystallizing together of isomorphous compounds. Alum, rocksalt, garnet and other substances are described. The same reason is assigned for uniaxial minerals exhibiting a biaxial character.

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[1] Neues Jahrbuch für Min., etc., 1884, I, 216.

[2] Ib., 1883, II, p. 258.

[3] Jahresbuch der Wissensch. Anstalten zu Hamburg, 1883, p. 67.

[4] Neues Jahrbuch für Min., etc., 1884, I, 63.

[5] Ib., 1884, II, p. 1.

[6] Zeitschrift für Krystallographie, IX, 1884, pp. 38–72.

[7] Ib., X, 1885, 41–57.

[8] Neues Jahrbuch für Min., etc., 1885, I, 96–118

W. Voigt,[1] of Göttingen, has developed mathematically a theory to account for the peculiar interference figures exhibited by certain pleochroic (idiocyclophanic) crystals recently described by Bertin (*Zeitschr. f. Kryst.*, III, p. 449).

THE FELDSPARS.—Professor Des Cloizeaux, of Paris, has just published at Tours a valuable memoir of ninety-two pages, entitled "Oligoclases et Andésine," being an enlargement of his former paper, " Nouvelles recherches sur les propriétés optiques des oligoclases," which appeared in 1880,[2] and a direct continuation of his still more recent studies on albite[3] (vid. NATURALIST, 1884, p. 184). The latter paper describes thirty-four specimens from different localities, of which ten are American (Mineral Hill, Pa., Moriah, N. Y., Middletown, Ct., and Canada). In the present communication the number of oligoclase specimens examined has been increased from forty-four to sixty-six. These are divided into the following four classes:

1st. *Anomalous oligoclase or oligoclase-albite.*—The surface perpendicular to the plane of the optical axes truncates the *acute* edge P:M., making with P an angle of 93°. The extinction on M makes an angle of 6°–12° with the edge P:M, in a positive sense according to Schuster. Oxygen ratios vary between 1 : 3 : 10 and 1 : 3 : 10.7., corresponding to the mixtures. $Ab_8\ An_1$—$Ab_5\ An_1$.

2d. *Anomalous oligoclase.*—Plane of the optical axes is parallel to the basal pinacoid or perpendicular to the brachypinacoid. Extinction on M is positive, 6°–9° inclined to the edge P:M. Oxygen ratios vary from 1 : 3 : 10.4 to 1 : 3 : 9, corresponding to the mixtures $Ab_4\ An_1$—$Ab_2\ An_1$.

3d. *Normal oligoclase.*—Surface perpendicular to the opt. axial plane truncates the *obtuse* edge P:M, making with P an angle of 98°–104°. The extinction on M is positive, inclined 1°–6° (generally 2°–4°) to the edge P:M. Oxygen ratio is 1 : 3 : 9 := $Ab_2\ An_1$.

4th. *Andesine.*—Surface perpendicular to the plane of the optical axes truncates the *obtuse* edge P:M, making an angle of 110°–120° with P. The extinction on M is negative, varying from 1°–10°. Sp. Gr. = 2.67. Oxygen ratio 1 : 3 : 8, corresponding to $Ab_1\ An_1$.

The first-class includes nine specimens examined, of which one is American (Colton, N. Y.). The second-class includes eleven specimens of which one is from Colton, N. Y., and one from Mineral Hill, Del. Co., Pa. The third-class includes sixteen specimens, mostly from Scandinavia, and the fourth-class nineteen specimens, of which one was from Château Richer in Canada. The remaining eleven specimens examined by the author did not yield altogether satisfactory results.

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[1] Neues Jahrbuch für Min., etc., 1885, I, 119–141.

[2] Bull. Soc. Min. de France, 1880, III, 157.

[3] Ib., 1883, VI, 89–121.

Very interesting facts regarding the relations between the monoclinic and triclinic feldspars have been obtained by Dr. Förstner of Strassburg, through his studies of material from the island of Pantellaria.[1] He finds that both the potash (orthoclase) molecule and the soda (albite) molecule undoubtedly possess a stable and unstable modification, the former being for orthoclase in the monoclinic, the latter in the triclinic system (microcline), while exactly the reverse is the case for albite. It has long been known that some varieties of orthoclase, especially sanidine, contain a very considerable amount of soda and the existence of the triclinic form of the potash molecule has been universally acknowledged since the classic investigations of Des Cloizeaux.[2] Förstner finds on Pantellaria that a monoclinic feldspar containing 2.1 albite molecules to every molecule or orthoclase occurs as a constituent of a certain rhyolite (Cala Porticello and Bagno dell' acqua). This he calls "Natronorthoclase." It is very similar both in composition and structure to that described by Brögger[3] and Mügge[4] from Norway, and by Klein,[5] from Hohen Hagen, near Göttingen. Even more common on Pantellaria, as a constituent of the augite andesite and pantellarite (a dacite characterized by a peculiar triclinic amphibole called "Cossyrite[6]") is a series of triclinic feldspars intermediate between albite and microcline. Very remarkable is the ease with which these intermediate members—natron-orthoclase and albite-microcline—can be transferred by artificial means from one modification to the other. Some albite-microcline (Cuddia Mida) shows, even by a temperature of 86°–115° C., a disappearance of its twinning lamellæ and by other optical changes is plainly seen to pass from the triclinic to the monoclinic system. The oligoclase-microcline from Mt. Gibele, on the other hand, remained unchanged even at 500° C. Most feldspars of this series changed back to their original triclinic form when the temperature was again reduced, except when it had been raised as high as 500°, in which case the change to the monoclinic form was as a rule permanent. The natron-orthoclase showed no change while being heated, but on being cooled from a temperature of 264° C., it passed from the monoclinic to the triclinic modification, having a distinct system of twinning lamellæ and an inclined extinction of 2° against the cleavage lines on oP. The same feldspar was also found to undergo a like alteration when subjected to pressure, thus experimentally proving the suggestion of Van Werveke[1] that many plagioclase crystals owed their twinning striation to the pressure to which they had been subjected in rocks.

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[1] Zeitschrift für Krystallographie, VIII, 1883, pp. 125–202; IX, 1884, pp. 333–352.

[2] Comptes rendus, 1876, p. 885.

[3] Die silurischen Etagen 2 und 3 im Kristianiagebiet, etc.; Kristiania, 1882, pp. 258–262; 293–307.

[4] Neues Jahrbuch für Min., etc., 1881, II, 106.

[5] Göttinger Nachrichten, 1878.

[6] Zeitschrift für Krystallographie, V, 348.

HYPERSTHENE-BASALT.—A correction should be made to the statement in the Petrographical Notes (NATURALIST, April, 1885, p. 395), that Mr. J. S. Diller was the discoverer of the new rock type hypersthene-basalt. This rock was described by Messrs. Hague and Iddings in 1883,[2] in their Note on volcanoes of Northern California, Oregon and Washington Territory, and again in 1884[3], in their Notes on the volcanic rocks of the Great basin. It is, however, here spoken of as olivine-bearing hypersthene andesite, or as hypersthene-bearing basalt. These authors regard the hypersthene and olivine as playing complementary *rôles* in the lavas, *i. e.*, one being a singulosilicate and the other the corresponding bisilicate; in case a basalt grows slightly more acid the hypersthene replaces the olivine, which therefore diminishes in quantity as the other increases. In this way hypersthene-basalt may be regarded as a connecting link between basalt and hypersthene-andesite.

BOTANY.[4]

FERTILIZATION OF THE WILD ONION (ALLIUM CERNUUM).—The wild onion grows in masses along the banks of shady streams in August. The flowers are arranged in dense umbels, which are nodding as their specific name implies. They are of a beautiful rose color, presenting an attractive appearance, when seen from a distance. There are six stamens, which arrive at maturity one after the other, the outer row developing first (Fig. 1). In this successive development they resemble the usual course in the an-

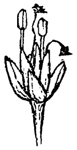
Fig. 1.

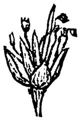
Fig. 2.

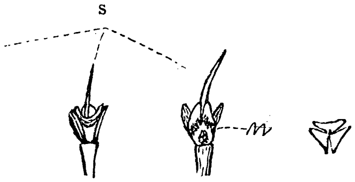

Fig. 3.

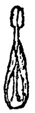
Fig. 4.

Fig. 1. Antheriferous period. Fig. 2. Female state. Fig. 3. The three processes with nectaries (*n*) at their junction. Fig. 4. A stamen attached to an inner member of the perianth and enfolded by it.

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[1] Neues Jahrbuch für Min., etc., 1883, II, p. 87.

[2] American Journal of Science, Sept., 1883, p. 233.

[3] Ib., June, 1884, p, 457 and p. 460.

[4] Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.